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Study on the Influence of Mineral Resources Development Structure on Development Efficiency

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1 Introduction

Adjusting structure, promoting transformation is the major problem that our country deepens the comprehensive reform and achieves sustainable development. Without exception, the mining industry also exist serious situation of adjusting structure. The literatures have respectively studied the problems about mineral resources development structure (DS) and development efficiency (DE), but pay little attention to the relationship between structural elements and efficiency factors. It has great practical significance to analyze the relationship between structural elements and efficiency factors and it contributes to a better understanding the impact of structural elements on the efficiency factor for mining enterprises. Thus, mining enterprises can adjust the input of structural elements so as to obtain more benefit, and promote the transformation and upgrading of mining enterprises.

2 Modeling and Analysis Method

According to data availability, operational feasibility principle, this article chooses five elements as typical elements of mining enterprise DS, the five elements are proportion of technical personnel (PTP), capacity utilization of ore mining (CUOM), capacity utilization of ore dressing (CUOD), degree of automation (DA), matching degree of mining and dressing capacity (MDMDC). And chooses four factors as typical elements of DE, they are extract recovery rate (ERR), ore (mineral) dressing recovery percentage (ODRP), comprehensive utilization ratio of mineral resources (CUTMR), mine recovery and governance rate (MRGR).

The authors take the development structural elements as input, the factors of development efficiency as output, collect the development data of metal mining enterprises in Panxi region as training data, use a neural network with one hidden layers to build the function relationship between development structural elements and factors of development efficiency under existing institutional mechanisms. Based on this evidence, when some structural elements are changing, we can observe the corresponding changes about the factor of DE. Through sensitivity analysis, we can provide some suggestions for transformation and upgrading of mining enterprises and mineral resources management.

3 Conclusions

We train a neural network, in which there are 5 neurons in the input layer, 4 neurons in the output layer, 5 neurons in the hidden layer, to approximate the function relationship between development structural elements and factors of development efficiency. After excluding incomplete data and abnormal data, the authors collect the DS data and DE data of 72 mining enterprises in Panxi to train the aforementioned neural network. A run of backpropagation algorithm for the neural network shows that the average error is 0.5076. According to the trained neural network, some results of sensitivity analysis of DE on development structural elements are shown in Fig. 1-4.

The following conclusions can be obtained from the diagram analysis:

1) PTP has a significant influence on MRGR; the effect on ODRP and MRGR is remarkable for the other structural elements including CUOM, CUOD and MDMDC, all influence is not always positive.

2) All development structural elements have little effect on the ERR, and have the biggest impact on MRGR.

3) All development structural elements have influence on CUTMR, but the influence degree is limited. When PTP, CUOM, MDMDC increase, the CUTMR will decrease.

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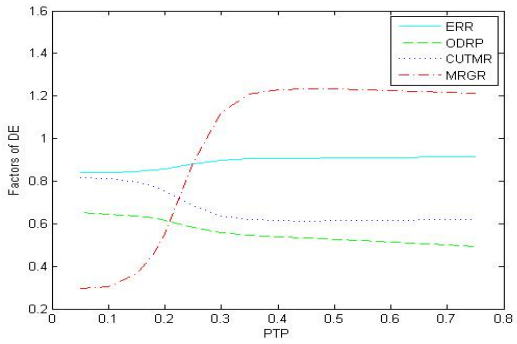

Fig. 1. Plot of Factors of DE against PTP.

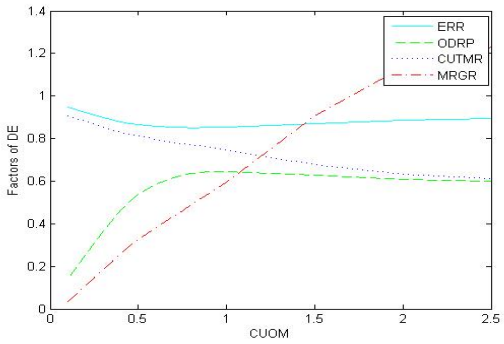

Fig. 2. Plot of Factors of DE against CUOM.

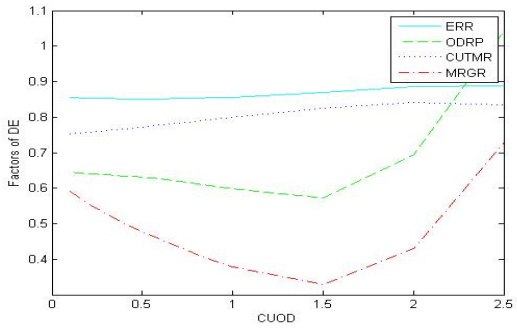

Fig. 3. Plot of Factors of DE against CUOD.

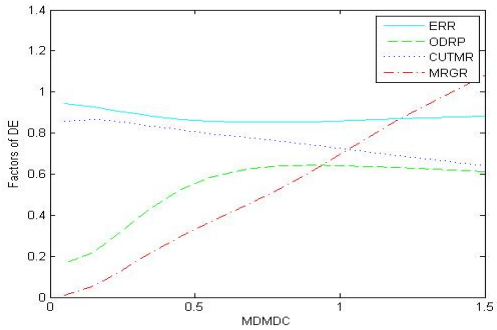

Fig. 4. Plot of Factors of DE against MDMDC.

These conclusions show that the impact on factors of DE are complex when the development structural elements will change, a lot of things need to do and have the ability to do in order to optimize DS.

It should be pointed out that the function relationship that is approximated by the neural network with one hidden layer is a function relationship between the typical structural elements and the typical factors of DE under the existing institutional mechanisms in Panxi . The above sensitivity analysis showed that the role of science and technology talents science and technology talents science and technology talents science and technology talents science and technology talents science and technology talents science and technology talents has not fully displayed in the process of mining development under the existing system and mechanism. The human factor is the most essential factor in the process of adjusting structure and promoting transformation for the mining enterprise. To improve the quality of mining economy fundamentally, it is necessary to innovate system and mechanism, increase the quantity of science and technology talents and upgrade the quality of personnel, provide a stage to stimulate potential of scientific and technological personnel and let them play a key role in mining development.

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